

dorsal pleural appendage small; ventral pleural appendage large, the rostriform lobes bearing a single acute spine.

Habitat.—Formosa.

Holotype, ♂, Urai, altitude about 1,500 feet, October 2, 1921 (T. Esaki).

THE MOSQUITOES OF THE GLACIER NATIONAL PARK, MONTANA

(*Diptera, Culicidæ*)

BY HARRISON G. DYAR

The Glacier National Park occupies the crest of the Rocky Mountain Range, including the Continental Divide. The altitude of the range is not great; but the mountain masses, traversing an otherwise arid region, carry the Canadian fauna southward, almost in its entirety. On the west, the approach is gradual, the forested area reaching to the region about Whitefish Lake; but in the east, owing to the abrupt faulting of the geological formation known as the Lewis Overthrust, the transition to the bare prairie is sudden. The railroad follows the middle fork of the Flathead River and tributary creeks, and approaching from the west the change at the summit is abrupt and startling. The forest carpet is suddenly broken. Wide reaches of prairie appear, and when one arrives at the Glacier Park station, the mountains are behind, and the open prairie is about. The forest is seen in little patches hanging precariously to the higher slopes and huddled in narrow strips in the river valleys as these reach out into the plains.

In a former paper (*Ins. Ins. Mens.*, v, 104-121, 1917), I listed the mosquitoes to be found on the plains of Montana. The present forms a supplement to that, and adds the species of the mountains of the State. On reaching the prairie, the appropriate mosquitoes do not at once appear. There is a mosquito-less area of perhaps some fifty miles before the accustomed forms appear in their habitual abundance. No doubt there is an occasional migration. In fact a specimen of *Aedes*

nigromaculis, the dominant prairie form, was taken at Belton, well in the forested area; but in general this statement holds true. Further east on the plains mosquitoes appeared, in places in great abundance, following unusually heavy rains. It appears, therefore, that this is a permanent condition, and not due to temporary dryness of the region adjoining the mountains, for this area was not unduly dry.

Of the species comprising the Canadian fauna, only one, *Aedes punctor* Kirby, is absent. This absence is worthy of note, for *punctor* is one of the dominant and characteristic species of the fauna proper. However, in the Rocky Mountain region it appears to have dropped out completely. Certain large individuals of *lazarensis* with fused mesonotal bands raised a doubt at times, but there was nothing among the many hundreds of specimens taken that could be positively identified as *punctor*. The dominant species of the black-legged group is *lazarensis*. It occurs everywhere in forest, abundantly on the west of the divide, and east also, following down the river valleys as far as there are any trees. The variation in coloration is, as usual, considerable; but what makes identification a trial to the nerves is the occurrence of natural hybridization. Many of the specimens looked to me like hybrids when captured; but it was only on careful examination that the fact became apparent with the mounting of two hybrid males, *intrudens* x *lazarensis*. These hybrids had an abnormal appearance, but from the coloration before mounting, I took them to be a cross between *cataphylla* and *pullatus*. Neither of these species, however, proved to be involved. These hybrids occurred in the greatest abundance in the deep forest far from habitation. At Belton, on the railroad, the phenomenon was not noted, nor at the town of Whitefish, where large areas of the forest have been cut over. But by the kindness of the Superintendent of the Park, Mr. J. Ross Eakin, we were enabled to visit a remote locality, some twelve miles to the northwest of Lake McDonald. Here more hybrids were encountered than at any other place. Some also were taken to the east of the divide, the males in question within a few miles of

the town of Glacier Park. The habits of these males were abnormal, as they were taken resting in grass, which is never the case with either of the parent species. The only males found were *intrudens* x *lazarensis*; but from the appearance of the females, *cataphylla* x *lazarensis*, *pullatus* x *lazarensis* and even *cataphylla* x *pullatus* occurs.

These hybrids had the appearance of first crosses, and perhaps do not persist. If they do, we might as well revert to the old appellation of "the mosquito" and let the species go.

Aedes cataphylla is rare in the forested region west of the divide, but occurs. In the open spaces near forest east of the divide it becomes more abundant.

Of the species with ringed legs, *excrucians* and *fitchii* occur in the forests west of the divide, as is normal for the fauna, and also extend through in wooded patches to the east. The majority of the specimens to the east, however, consists of *mutatus*, the three forms here in usual association. Many females with speckled wings were taken about Glacier Park Station, which should be *fitchii mimesis*; but no males were secured to prove the identification, and it may be that the range of variation of *mutatus* has been underestimated. No males were taken belonging to the *stimulans* series, so it is not known whether one of these occurs also.

In detail the occurrence was as follows:

Aedes punctor Kirby.

Apparently does not occur.

Aedes aestivalis Dyar.

Not uncommon in the forest to the west of the divide, preferring open spaces. This species breeds in the flood-water particularly of lakes. No larvae were obtained in the National Park, as the season was too far advanced by the time we reached there, and the flood-pools had drained themselves. Larvae were obtained, however, at Sandpoint, Idaho. The larva was previously known in only a single example, bred from eggs secured at Kaslo, British Columbia, in 1903. This larva had single head-hairs, but must have been an aberrant example,

as the Sandpoint larvae had the upper hairs in threes, the lower in twos, with very considerable variation. Thus the supposed differences between this larva and that of *hirsuteron* Theob. disappear. I compared these larvae with *hirsuteron* larvae obtained at Hartford, Connecticut, and cannot find any differences. The lateral hair of the sixth abdominal segment is commonly single in both, though occasionally it is double. The skin in both is armed with rather long, sparse spicules. It appears, therefore, that *aestivalis* cannot be more than a race of *hirsuteron*, if not a pure synonym, there being no difference in larva, male hypopygium or adult coloration. The only remaining difference is a slight one of habit, *aestivalis* being found in the vicinity of lakes, while *hirsuteron* frequents the flood-pools in river valleys.

On the other hand, in regard to the nearly related *aldrichi* D. & K., which frequents river flood-pools in the west, certain differences are apparent in the larvae. Larvae of *aldrichi* were obtained in a river overflow of wooded bottom-land at Rexford, Montana. The larva has been mentioned by Mr. E. Hearle (Can. Ent., liii, 48, 1921). The lateral hairs of the sixth abdominal segment are always single; the skin is without the little spines, these spicules being very minute, the appearance more granular than spiculate. In addition the air-tube of *aldrichi* is somewhat shorter and the pecten runs a little further out, reaching just beyond the middle; the teeth of the lateral comb of the eighth segment have a sharp central thorn, with distinctly less lateral fringes than in *aestivalis* and *hirsuteron*. The adult of *aldrichi* is smaller, and has the mesonotal dark band divided. Rarely this band is united, and in *aestivalis* there is occasionally a trace of division; but this variation is not more than is common in mosquitoes.

Mr. F. W. Edwards has made *aldrichi* a synonym of the European *sticticus* Meigen (Bull. Ent. Res., xii, 312, 1921); but I think this is an error. From the descriptions (I am personally unacquainted with the European form) the species might be *hirsuteron*, and if this species is really common to

America and Europe, there would be less hesitation in making the synonymy *aestivalis* = *hirsuteron*.

New data on the distribution of these forms are at hand. When passing through Montana in 1917, the Yellowstone Valley was followed, and only *aldrichi* was met with in the river bottoms. I did not know *hirsuteron* from west of Minnesota, and therefore the distribution of *aestivalis* seemed considerably detached, occurring as it did only on the west of the Continental Divide. However, the past season the valley of the Missouri was followed. Here *hirsuteron* occurred in Minnesota in East Grand Forks, and across the river in Grand Forks, North Dakota. Without the larva it is not possible to be certain, but westward the specimens from Poplar and Glasgow, Montana, seemed to be still *hirsuteron* rather than *aldrichi*, for, though sometimes small, the mesonotal band is quite solidified. Still further west, at Havre, Montana, the species seemed to be the same. There is therefore no very great gap between *hirsuteron* and *aestivalis*, which occurs as far to the east as Belton, Montana.

These forms are, of course, all closely allied at the best. It seems that *hirsuteron* is the stem form, with *aestivalis* doubtless the same, and perhaps both equal the European *sticticus*. *Aldrichi* is a close derivative, adapted also to the flood-waters, but intensified in habit, for it occurs in the great flood-waters where the western rivers overflow wide territory, while *hirsuteron* does not occur here, but in smaller floods. The differentiation is hard to apprehend, but there seems to be undoubtedly a differentiation, for the two species do not generally occur together. From *hirsuteron* is derived *idahoensis*, inhabiting the dry open tree-less portions of the river valleys, and breeding in early spring pools. From *idahoensis* comes *spenceri*, frequently the open grassy prairies and wholly detached from the river valleys.

Spenceri has been, from previous records, strictly a Canadian species; but it occurred to us not uncommonly in half a dozen places in North Dakota and in western Minnesota.

Aëdes communis lazarensis Felt & Young.

The most common species of the black-legged group. East of the divide many normally colored but small examples occurred, but in the forests to the west, the mesonotum was often dark brown or gray and variably ornamented. Great confusion also was caused by the numerous hybrids, as previously noted.

Aëdes pionips Dyar.

No adults were taken, as we left the park early in July before the species was on the wing. Two large breeding pools, however, were found, one at the outlet of Lake McDonald, the other in the trail along the margin of Two Medicine Lake. The former culture was successful and many adults emerged; but the latter was almost totally destroyed by great numbers of *Eucorthera underwoodi* larvae, whose pupae occurred more abundantly in this puddle than I ever saw them before.

Aëdes cataphylla Dyar (*prodotes* Dyar).

Frequenting open spaces near forest, and consequently rare to the west of the divide; rather common along the eastern base of the mountains, but not extending into the prairie. The species had been long on the wing by the first of July, and many examples were worn. Hybrids between this and *lazarensis* are indicated by the coloration of certain females; but it may be that these are aberrant forms of *impiger*, as no males were obtained of the apparently crossed forms.

Aëdes impiger Walker (*decticus* H., D. & K.).

This occurred very rarely, but throughout the forest.

Aëdes diantæus Howard, Dyar & Knab.

Occurring in the most shaded and cool parts of the forest, absent elsewhere. A lovely place was found about two miles from the town of Whitefish where this species was, and again in low land where McDonald Creek empties into the Flathead River, this latter place having been kindly described to us by Mr. Eakin, who sent a boy to show the way. Mrs. Dyar, who was with me, saw a pair of mosquitoes in copulation on my coat-

sleeve, but they escaped capture. She was wielding the bottle at the time and hesitated through surprise. She "could hardly believe her eyes" as she said, for we were not expecting *diantaeus*.

Aëdes intrudens Dyar.

Throughout the forest in dark woods, but not quite so particular as to location as *diantaeus*. The hybrids between this and *lazarensis* perhaps deserve detailed mention. In the male hypopygium the apical lobe is strongly hairy outwardly as in *lazarensis*, not weakly so inwardly as in *intrudens*. Apical hair-tuft of *intrudens* wanting, though the inner margin of the whole lobe is unusually hairy. Basal lobe with the two spines on a pedicel of *intrudens*, but they are lengthened, flattened and irregular. The spine on one side is large, but there is some rugosity between these spines suggestive of the *lazarensis* lobe. Claspette angled and with basal hairy part as in *intrudens*, but the angulation is less sharp, there is no prominence or stout seta. Filament broader than in *lazarensis*, longer than in *intrudens*, with only a trace of the internal vacuolations of *intrudens*.

Aëdes pullatus Coquillett.

Rather rare, but occurring throughout the forest. Much variation was noted, and it is supposed that some of the specimens are hybrids with *lazarensis* and others with *cataphylla*, but no males of these mixed forms were obtained.

Aëdes trichurus Dyar.

This large and interesting species was a feature of the forest on the west of the divide, but no specimens came through to the east, even high in the range. I am inclined to think that this is specifically distinct from the eastern *cinereoborealis* F. & Y., but unfortunately the male remains unknown.

Aëdes cinereus Meigen.

A male was taken near the town of Whitefish, and the species doubtless exists sparingly throughout the forest.

Aedes excrucians Walker.

Not common, but generally distributed in the forest proper to the Canadian zone. A male was demonstrated from Whitefish and another from the foot of the Mt. Henry trail, not far from the Glacier Park Hotel east of the divide.

Aedes fitchii Felt & Young.

Very common in the forest. Vast swarms of the males were seen at Belton after sunset on a hillside between openings in the trees. We caught them with a net till we were tired of the sport. The species seems also to occur commonly east of the divide, or perhaps the form *mimesis*, but no males were taken.

Aedes increpitus mutatus Dyar.

Very abundant in the river valleys to the east of the divide. We observed great swarms of the males. The swarming began before sunset. One evening, following a road back from the Glacier Park Hotel, we came to a place where the road dipped into a creek-bottom lined with willows. The males were flying close to the ground in hollows, banks and near bushes, just out of reach of the last rays of the setting sun. Later the swarms were seen higher up among the willows in the river-bottom.

Aedes nigromaculis Ludlow.

This species belongs to the prairie fauna. A single stray example was taken at Belton.

Aedes canadensis Theobald.

Scarce, but throughout the lower forest to the west of the divide.

Aedes vexans Meigen.

A few examples, more common at Whitefish than in the deep forest.

Culiseta impatiens Walker.

Two females were taken in forest in the valley of Two Medicine River to the east of the divide. Probably sparingly distributed throughout the forest.

Culiseta incidens Thomson.

Not taken, though as it occurs at Banff, it may possibly be found further down the range.

Before leaving the subject of the Rocky Mountain fauna, it may be well to refer to other collections made in the same general region. The writer, with Messrs. Caudell and Currie, collected in Kaslo, British Columbia, in 1903. At that time I had no knowledge of the adults and had to depend on the determinations of others. All of the black-legged species were at first lumped together as "*punctor*." Later Mr. Coquillett differentiated the species *pullatus*, but this was made again the receptacle of several forms. Most of the old specimens are in bad condition, but on going over them again, I easily separated a series of *cataphylla* and another of *lazarensis*, showing that we have to do with practically the same fauna as at Glacier National Park. The species *trichurus* was described from Kaslo. Later I made collections at Banff and Lake Louise. The fauna of the former is dominated by *intrudens* and *cataphylla*, of the latter by *cataphylla* alone. I have also good collections from Mr. C. Garrett from Cranbrook, B. C., and here, also, *cataphylla* is the dominant form. The predominance of *lazarensis* in the Glacier National Park indicates a more continuously forested condition. Banff has many open spaces, and Lake Louise and Cranbrook are dominated by the open fauna. Of course the occurrence of suitable river-pools has much to do with the abundance of *cataphylla*. Such pools appear to be scarce in the Glacier National Park.

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